

REMARKS

Claims 1-24 are pending and stand rejected. Claims 14-24 are cancelled, without prejudice. Claims 1-13 are amended and new claims 25 and 26 are introduced by this Amendment. Upon entry of this Amendment, claims 1-13, 25 and 26 will be pending and are presented for examination. Applicants submit that no new matter is introduced by the amendments and new claims, and that claims 1-13, 25 and 26 are in condition for allowance.

Amendments to the Specification

The amendment to the Specification places the subject matter recited by original claims 1-12 within the Specification. Accordingly, Applicants submit no new matter is introduced by the amendment to the Specification.

Amendments to the Claims

Claims 1-13 are amended, in part, to correct informalities in the English language translation of the original German language claims and to conform the claims to current U.S. practice. Support for the amendments to the claims is found throughout the originally filed specification, drawings and claims. The following list indicates where some examples of support can be found for amendments to: claim 1, at page 3, second paragraph, and last paragraph, first sentence; claim 5, at page 6, last paragraph; claim 6, at page 6, last paragraph; and claim 11, at page 5, third paragraph.

Accordingly, Applicants submit no new matter is introduced by the above amendments.

New Claims

New dependent claims 25 and 26 are directed to alternative embodiments of methods of the invention. Support for new claims 25 and 26 is found in the originally filed specification at least on page 3, last paragraph, first sentence and on page 6, third full paragraph, third sentence.

Accordingly, Applicants submit that no new matter is introduced by the new claims.

Objections to the Drawings

The drawings are objected to because Fig. 1 allegedly lacks clarity, and because Figs. 2-4 contain information that is not in English. Corrected drawings are submitted herewith to remedy these objections. Corrected Fig. 1 has improved visibility due to the removal of the gray background of original Fig. 1. The phrase "ERSATZBLATT (REGEL 26)," which means "REPLACEMENT SHEET (RULE 26)," has been deleted from corrected Figs. 2-4.

Accordingly, Applicants respectfully request that the corrected drawings be accepted and that the objection to the drawings be reconsidered and withdrawn.

Objections to the Specification

The Specification is objected to as being informal for allegedly relying on the claims for disclosure. The amendment to the Specification places the disclosure of the claims within the Specification. Accordingly, Applicants respectfully request that the objection to the Specification be reconsidered and withdrawn.

Rejection of Claims 1-24 Under 35 U.S.C. § 112, second paragraph

Claims 1-24 are rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. The Examiner indicated that the claims "appear to be a literal translation into English from a foreign document and are replete with grammatical and idiomatic errors."

Claims 14-24 are cancelled. Applicants respectfully submit that the amendments to claims 1-13 remedy grammatical and idiomatic errors, and conform the claims with U.S. practice. Accordingly, Applicants respectfully request that the rejections under 35 U.S.C. § 112, second paragraph, of claims 1-13 be reconsidered and withdrawn.

Rejection of Claims 1-4, 7, 9-18 and 22-24 Under 35 U.S.C. § 103(a)

Claims 1-4, 7, 9-18 and 22-24 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,080,531 to Carter et al. ("Carter") in view of International Patent Application Publication No. WO 95/02895, European Patent Application Publication No. 497247 and the state of the art allegedly admitted by the applicants in the

specification. Claims 14-18 and 22-24 are cancelled. Applicants respectfully submit that claims 1-4, 7 and 9-13 are patentable over Carter in view of WO 95/02895, EP 497247, and the allegedly admitted state of the art for the following reasons.

Amended independent claim 1 recites a method for cleaning semiconductor elements with ozonized deionized water in a tank. The method includes, in part, adding sufficient CO₂ to an ozone/oxygen mixture supplied to a contactor to increase an ozone concentration in the ozonized deionized water delivered to the tank. For the following reasons, Carter alone does not teach or suggest adding sufficient CO₂ to the ozone/oxygen mixture supplied to the contactor to increase an ozone concentration in the ozonized deionized water delivered to the tank.

Carter does not teach adding CO₂ to an ozone/oxygen mixture supplied to a contactor because Carter only teaches that CO₂ is added to ozonized water (i.e., after the water has passed through a contactor or been ozonized by other means). See Carter, column 6, lines 13-15 (stating that "[t]he CO₂ may be introduced into the water by any convenient method, including bubbling CO₂ gas through the ozonated water.") Further, Carter teaches two apparatuses that deliver additives from a canister (124) to ozonized water after the ozonized water is received by the apparatus from an ozonized water (133) source. See Carter, Figs. 2 and 4.

Moreover, Carter provides no suggestion to add CO₂ to an ozone/oxygen gas mixture supplied to a contactor because Carter is not directed at increasing the ozone concentration in ozonized water delivered to a tank, as recited by claim 1. Rather, Carter is directed at the problem of ozone loss arising from a substrate cleaning process, i.e., after delivery of ozonized deionized water to a substrate. See, e.g., Carter, column 4, lines 56 (stating that, during cleaning of a substrate, "metal lines appear to catalyze the reaction [that destroys] ozone.") Carter would not motivate one to modify the teachings of Carter by adding CO₂ to an ozone/oxygen gas mixture delivered to a contactor because Carter suggests no benefit to such a modification.

WO 95/02895, EP 497247 and the allegedly admitted state of the art, each alone, do not teach, suggest, or motivate a method for cleaning semiconductor elements in a tank that

includes adding sufficient CO₂ to an ozone/oxygen mixture supplied to a contactor to increase an ozone concentration in ozonized deionized water delivered to the tank. Therefore, Carter, WO 95/02895, EP 497247, and the allegedly admitted state of the art, in any reasonable combination, do not teach, suggest, or motivate a method for cleaning semiconductor elements in a tank that includes adding sufficient CO₂ to an ozone/oxygen mixture supplied to a contactor to increase an ozone concentration in ozonized deionized water delivered to the tank. Consequently, Applicants claimed invention, considered as a whole, is unobvious over Carter in view of WO 95/02895, EP 497247, and the allegedly admitted state of the art since the cited references do not teach, suggest, or motivate all of the features of independent claim 1, as amended.

Amended independent claim 7 recites an apparatus for cleaning semiconductor elements with ozonized deionized water in a tank. The apparatus includes, in part, a CO₂ source connected via a valve to a connection pipe that directs an ozone/oxygen mixture from an ozone generator to a contactor to introduce CO₂ to the ozone/oxygen mixture. For the reasons described above for claim 1, Carter, WO 95/02895, EP 497247 and the allegedly admitted state of the art, each alone or in any reasonable combination, do not teach, suggest, or motivate an apparatus that includes a CO₂ source connected a connection pipe that directs an ozone/oxygen mixture from an ozone generator to a contactor. Consequently, Applicants claimed invention, considered as a whole, is unobvious over Carter in view of WO 95/02895, EP 497247 and the allegedly admitted state of the art since the cited references do not teach, suggest, or motivate all of the features of independent claim 7, as amended.

Claims 2-4, 7 and 9-13 depend directly or indirectly from either amended claim 1 or amended claim 7. Because claims 1 and 7 are unobvious over Carter in view of WO 95/02895, EP 497247 and the allegedly admitted state of the art, claims 2-4, 7 and 9-13 also are unobvious. Therefore, Applicants respectfully request that the rejection of claims 1-4, 7 and 9-13 be reconsidered and withdrawn.

Rejection of Claim 5, 6, 8, 14 and 19-21 Under 35 U.S.C. § 103(a)

Claims 5, 6, 8, 14 and 19-21 are rejected under 35 U.S.C. § 103(a) over the same art cited above and further in view of U.S. Patent No. 5,370,846 to Yokomi et al. ("Yokomi").

Claims 14, and 19-21 are cancelled. Applicants respectfully submit that claims 5 and 6 are patentable over Carter in view of WO 95/02895, EP 497247, the allegedly admitted state of the art and Yokomi, for the following reasons.

As described above, claim 1 is nonobvious over Carter in view of WO 95/02895, EP 497247 and the allegedly admitted state of the art. Therefore, claims 5 and 6, which depend either directly or indirectly from claim 1, are nonobvious over Carter in view of WO 95/02895, EP 497247 and the allegedly admitted state of the art.

Yokomi alone does not teach or suggest adding sufficient CO₂ to an ozone/oxygen mixture supplied to a contactor to increase an ozone concentration in ozonized deionized water delivered to a tank, as recited by each of claims 5 and 6. In contrast, Yokomi is directed to improving the performance of an ozone generator. See, e.g., Yokomi, column 2, lines 33-37. Therefore, Carter, WO 95/02895, EP 497247, the allegedly admitted state of the art and Yokomi, in any reasonable combination, do not teach, suggest, or motivate a method for cleaning semiconductor elements in a tank that includes adding sufficient CO₂ to an ozone/oxygen mixture supplied to a contactor to increase an ozone concentration in ozonized deionized water delivered to the tank.

Consequently, Applicants claimed invention, considered as a whole, is unobvious over Carter in view of WO 95/02895, EP 497247, the allegedly admitted state of the art and Yokomi since the cited references do not teach, suggest, or motivate all of the features of either claim 5 or 6, as amended. Accordingly, Applicants respectfully request reconsideration and withdrawal of the rejection of claims 5 and 6.

New Claims 25 and 26 In View of the Cited Prior Art

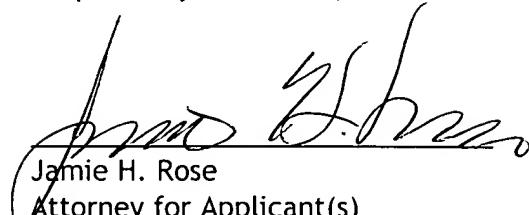
New claims 25 and 26 depend from claim 1. For all the above reasons, Applicants respectfully submit that new claims 25 and 26 are patentable in view of the cited references.

CONCLUSION

In view of the amendments and arguments presented herein, Applicants respectfully request that the rejection of claims 1-13 be reconsidered and withdrawn, with claims 1-13, 25 and 26 proceeding to issue. The Examiner is invited to call the undersigned, if the

Examiner believes that a telephone conversation could be helpful in expediting prosecution of the instant application.

Respectfully submitted,



Jamie H. Rose
Attorney for Applicant(s)
Testa, Hurwitz, & Thibeault, LLP
High Street Tower
125 High Street
Boston, Massachusetts 02110

Date: March 12, 2003
Reg. No. 45,054

Tel. No.: (617) 248-7376
Fax No.: (617) 790-0244

2573144

1. (Amended) A method for cleaning semiconductor elements with ozonized deionized water in a tank, the method comprising:

[Method for cleaning semiconductor elements, which are received in a tank, having ozonised, deionised (DI) ultrapure water, in the case of which method]

supplying oxygen to an ozone generator to generate an ozone/oxygen mixture according to the principle of silent electrical discharge;

[ozone is generated in an ozone generator, according to the principle of silent electrical discharge, by supplying highly pure oxygen, said]

supplying the ozone/oxygen mixture to a contactor which has a through-flow of deionized water to produce the ozonized deionized water;

[ozone being supplied to a contactor which has a through-flow of DI water, the ozone being dissolved in the DI water, and in which method]

adding sufficient CO₂ to the ozone/oxygen mixture supplied to the contactor to increase an ozone concentration in the ozonized deionized water delivered to the tank;

directing the ozonized deionized water through the tank to clean the semiconductor elements; and

[the ozonised DI water, possibly with the supply of further chemicals, is directed through the tank having the semiconductor elements in order to clean them and]

removing spent ozonized deionized water from the tank.

[the spent DI water is removed, characterised in that CO₂ is added to the ozone/oxygen mixture generated by the ozone generator.]

2. (Amended) [Method according to] The method of claim 1, [characterised in that] further comprising filtering at least part of the spent ozonized deionized water, and re-circulating the filtered spent ozonized deionized water with fresh ozonized deionized water produced by the contactor [the spent DI water is filtered and re-circulated at least partially and is mixed with fresh ozonised DI water].

3. (Twice Amended) ~~[Method according to]~~ The method of claim 1, [characterised in that the cleaning is carried out in] further comprising at least substantially excluding air from the tank while cleaning the semiconductor elements[, air being extensively or entirely excluded].
4. (Twice Amended) ~~[Method according to claims]~~ The method of claim 1, [characterised in that] wherein supplying the ozone/oxygen mixture [is supplied] to the contactor comprises causing the ozone/oxygen mixture to [in] counterflow relative to the [DI] deionized water.
5. (Twice Amended) The method of claim 1, further comprising adding CO₂ to the oxygen supplied to the ozone generator to provide a CO₂ concentration of less than 5000 ppm in the oxygen to improve a stability of an ozone concentration of the ozone/oxygen mixture generated by the ozone generator ~~[Method according to one of the claims 1, characterised in that CO₂ is directed into the highly pure oxygen flow which is supplied to the ozone generator in order to achieve a stable concentration behaviour of the ozone generator].~~
6. (Amended) The method of claim 5, wherein adding CO₂ to the oxygen supplied to the ozone generator comprises adding CO₂ to provide the CO₂ concentration in a range of 300-1000 ppm ~~[Method according to claim 5, characterised in that the CO₂ is supplied in a concentration of 300 to 5000 ppm].~~

7. (Amended) [System for] An apparatus for cleaning semiconductor elements, comprising:

[having] a container that [which] receives the semiconductor elements; [,

a device for generating ozonized deionized water connected to the container via pipes,
the container having a discharge pipe for spent ozonized deionized water, the device
comprising

~~[said container being connected to a device for generating ozonised, deionised (DI)~~
~~ultrapure water via pipelines and having a discharge pipe for spent DI water, the~~
~~device for generating the ozonised DI water having]~~

an ozone generator that generates an ozone/oxygen mixture, and

a contactor to which deionized water is supplied and which is connected to the
ozone generator via a connection pipe; and

~~[and a contactor, to which DI water is supplied and which is connected to the ozone~~
~~generator, characterised in that]~~

a CO₂ source connected via a valve to the connection pipe that directs the ozone/oxygen
mixture from the ozone generator to the contactor to introduce CO₂ to the
ozone/oxygen mixture

~~[a CO₂ source is provided which is connected to a connection pipe, which directs the~~
~~ozone/oxygen mixture between the ozone generator and the contactor via a valve in~~
~~order to introduce CO₂].~~

8. [Device according to claim 7, characterised in that the ozone generator has a supply pipe for highly pure oxygen, which supply pipe is connected to] The apparatus of claim 7, wherein the ozone generator is connected to an oxygen supply pipe, and wherein the CO₂ source is connected to the oxygen supply pipe via a control element selected from the group comprising [such as] a choke.

9. (Twice Amended) [Device according to claim 7, characterised in that] The apparatus of claim 7, wherein the container is configured as an overflow tank with a collection device for the spent [DI] ozonized deionized water.

10. (Twice Amended) The apparatus of claim 7, further comprising a filter through which a part of the spent ozonized deionized water is directed back to the ozonized deionized water generated by the device [Device according to one of the claims 7, characterised in that a part of the spent DI water is directed into the circulation via a filter and cleaning device].
11. (Twice Amended) The apparatus of claim 7, wherein the container is sealed to exclude surrounding air [Device according to one of the claims 7, characterised in that the container is sealed from the environment].
12. (Amended) The method of claim 1, wherein adding CO₂ to the ozone/oxygen mixture supplied to the contactor comprises adding CO₂ to provide a concentration in the ozone/oxygen mixture of up to 10% CO₂ [Method according to claim 1, characterised in that CO₂ is added in a concentration of up to 10%].
13. (Amended) The method of claim 2 further [characterized in that the cleaning is carried out in] comprising at least substantially excluding air from the tank while cleaning the semiconductor elements[, air being extensively or entirely excluded].

14 - 24 (Cancelled)

25. (New) The method of claim 12, wherein adding CO₂ to the ozone/oxygen mixture supplied to the contactor comprises adding CO₂ to provide a concentration in the ozone/oxygen mixture of less than 1.0% CO₂.
26. (New) The method of claim 1, wherein adding sufficient CO₂ to the ozone/oxygen mixture supplied to the contactor comprises adding sufficient CO₂ to cause the ozone concentration in the ozonized deionized water delivered to the tank to have a value in the range of 50 to 150 ppm.